

## **IEM's AI Modeling: Short-term COVID-19 Projections**

**Date: 7/1/20**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

**We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.**

### **AI-based Model Background**

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/1/20 11 a.m.

**Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.**

**Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.**

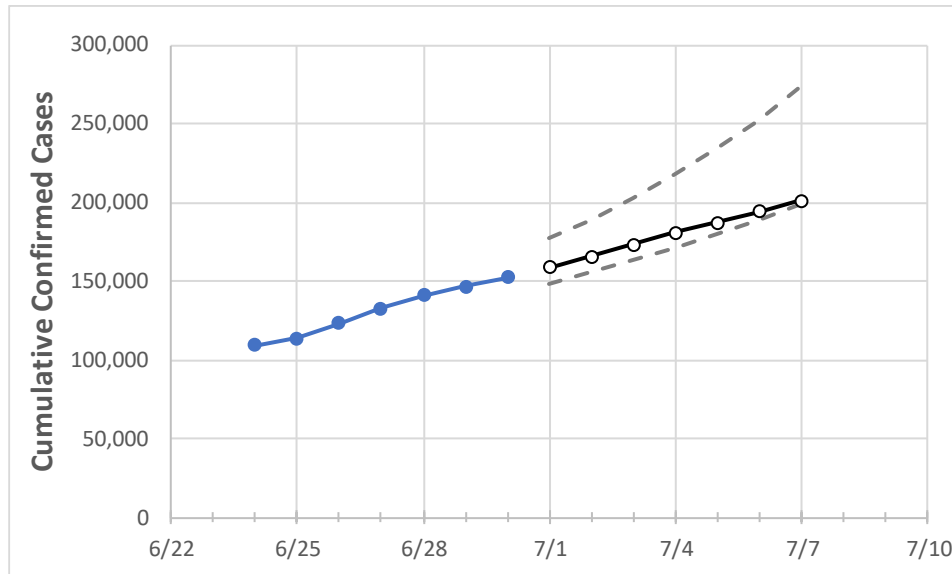
### **IEM's Modeling Lead**

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

## Florida State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Florida	132,495	141,072	146,341	152,434	158,677	165,651	173,333	180,811	187,366	194,130	201,320

*Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 20%, and are often within 10%, of actual confirmed cases.*

## Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Alachua	1,033	1,124	1,159	1,197	1,239	1,299	1,365	1,428	1,492	1,550	1,615
Broward	14,046	14,620	15,045	15,624	16,313	17,058	17,864	18,734	19,676	20,693	21,793
Charlotte	687	714	749	775	794	814	836	860	886	914	945
Collier	3,966	4,087	4,147	4,225	4,346	4,471	4,600	4,733	4,871	5,013	5,160
Duval	4,848	5,588	5,839	6,207	6,656	7,136	7,578	8,035	8,510	8,997	9,477
Hillsborough	9,130	9,918	10,323	10,752	11,551	12,428	13,390	14,445	15,601	16,869	18,258
Lake	1,098	1,192	1,252	1,302	1,356	1,431	1,504	1,581	1,664	1,748	1,821
Lee	4,956	5,188	5,363	5,588	5,813	6,055	6,314	6,592	6,890	7,209	7,552
Manatee	2,642	2,737	2,810	2,856	2,994	3,144	3,308	3,485	3,679	3,889	4,118
Miami-Dade	31,562	33,714	35,222	36,820	38,303	39,920	41,684	43,609	45,707	47,994	50,488
Okaloosa	563	601	636	666	696	730	766	805	848	895	946
Orange	8,837	9,671	10,014	10,314	10,626	11,394	12,164	12,838	13,584	14,369	15,063
Osceola	1,649	1,833	1,919	2,026	2,180	2,358	2,562	2,795	3,064	3,372	3,725
Palm Beach	12,928	13,389	13,711	14,150	14,589	15,048	15,528	16,031	16,556	17,104	17,678
Pasco	1,630	1,780	1,909	1,992	2,082	2,244	2,387	2,543	2,710	2,863	3,030
Pinellas	5,713	6,020	6,260	6,487	6,702	7,064	7,381	7,757	8,074	8,435	8,803
Polk	3,182	3,495	3,682	3,836	4,078	4,344	4,636	4,957	5,309	5,696	6,120
Sarasota	1,341	1,401	1,447	1,482	1,564	1,654	1,754	1,864	1,985	2,119	2,267
Seminole	2,202	2,366	2,477	2,566	2,672	2,848	3,022	3,177	3,349	3,502	3,651
St. Johns	756	837	895	948	1,003	1,072	1,145	1,209	1,278	1,343	1,410
Sumter	319	327	334	345	353	362	373	385	398	414	432
Volusia	1,745	1,933	2,024	2,105	2,230	2,369	2,524	2,697	2,889	3,104	3,342

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

### Florida Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	6/27	6/28	6/29	6/30	7/2				7/4				7/6			
Alachua	1,033	1,124	1,159	1,197	1,299	(260)	[62]	{31}	1,428	(286)	[69]	{34}	1,550	(310)	[74]	{37}
Broward	14,046	14,620	15,045	15,624	17,058	(3,412)	[819]	{409}	18,734	(3,747)	[899]	{450}	20,693	(4,139)	[993]	{497}
Charlotte	687	714	749	775	814	(163)	[39]	{20}	860	(172)	[41]	{21}	914	(183)	[44]	{22}
Collier	3,966	4,087	4,147	4,225	4,471	(894)	[215]	{107}	4,733	(947)	[227]	{114}	5,013	(1,003)	[241]	{120}
Duval	4,848	5,588	5,839	6,207	7,136	(1,427)	[343]	{171}	8,035	(1,607)	[386]	{193}	8,997	(1,799)	[432]	{216}
Hillsborough	9,130	9,918	10,323	10,752	12,428	(2,486)	[597]	{298}	14,445	(2,889)	[693]	{347}	16,869	(3,374)	[810]	{405}
Lake	1,098	1,192	1,252	1,302	1,431	(286)	[69]	{34}	1,581	(316)	[76]	{38}	1,748	(350)	[84]	{42}
Lee	4,956	5,188	5,363	5,588	6,055	(1,211)	[291]	{145}	6,592	(1,318)	[316]	{158}	7,209	(1,442)	[346]	{173}
Manatee	2,642	2,737	2,810	2,856	3,144	(629)	[151]	{75}	3,485	(697)	[167]	{84}	3,889	(778)	[187]	{93}
Miami-Dade	31,562	33,714	35,222	36,820	39,920	(7,984)	[1,916]	{958}	43,609	(8,722)	[2,093]	{1,047}	47,994	(9,599)	[2,304]	{1,152}
Okaloosa	563	601	636	666	730	(146)	[35]	{18}	805	(161)	[39]	{19}	895	(179)	[43]	{21}
Orange	8,837	9,671	10,014	10,314	11,394	(2,279)	[547]	{273}	12,838	(2,568)	[616]	{308}	14,369	(2,874)	[690]	{345}
Osceola	1,649	1,833	1,919	2,026	2,358	(472)	[113]	{57}	2,795	(559)	[134]	{67}	3,372	(674)	[162]	{81}
Palm Beach	12,928	13,389	13,711	14,150	15,048	(3,010)	[722]	{361}	16,031	(3,206)	[769]	{385}	17,104	(3,421)	[821]	{411}
Pasco	1,630	1,780	1,909	1,992	2,244	(449)	[108]	{54}	2,543	(509)	[122]	{61}	2,863	(573)	[137]	{69}
Pinellas	5,713	6,020	6,260	6,487	7,064	(1,413)	[339]	{170}	7,757	(1,551)	[372]	{186}	8,435	(1,687)	[405]	{202}
Polk	3,182	3,495	3,682	3,836	4,344	(869)	[209]	{104}	4,957	(991)	[238]	{119}	5,696	(1,139)	[273]	{137}
Sarasota	1,341	1,401	1,447	1,482	1,654	(331)	[79]	{40}	1,864	(373)	[89]	{45}	2,119	(424)	[102]	{51}
Seminole	2,202	2,366	2,477	2,566	2,848	(570)	[137]	{68}	3,177	(635)	[152]	{76}	3,502	(700)	[168]	{84}
St. Johns	756	837	895	948	1,072	(214)	[51]	{26}	1,209	(242)	[58]	{29}	1,343	(269)	[64]	{32}
Sumter	319	327	334	345	362	(72)	[17]	{9}	385	(77)	[18]	{9}	414	(83)	[20]	{10}
Volusia	1,745	1,933	2,024	2,105	2,369	(474)	[114]	{57}	2,697	(539)	[129]	{65}	3,104	(621)	[149]	{74}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.